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Maternal Comorbidities with Full-Term Pregnancy Who Gave Birth to Low Birth Weight Babies at Dr. Saiful Anwar Malang General Hospital

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ABSTRACT

Introduction: Stunting is a challenge for children's growth and development in the future, which has long-term impacts in the form of reduced cognitive abilities, decreased productivity, and increased risk of infection and non-communicable diseases. Low birth weight (LBW) is a major determinant of stunting in Indonesia. Various multidimensional factors contribute to low birth weight, including maternal factors.

Material and Methods: Quantitative descriptive research was conducted at Dr. Saiful Anwar general hospital from July 2021 to September 2022. The variables studied were age, education, occupation, parity status, medical history, number of antenatal care controls, height, mother's body mass index, and baby's birth weight.

Results: Of the 54 full-term pregnant women, the majority who delivered LBW babies were nulliparous (42.6%), aged 20-35 years during pregnancy (79.6%), had a history of hypertension during pregnancy (25.9%), antenatal care visits 1-5 times (48.1%), high school degree (48.1%), housewives (75.9%), height ranging between 151-160 cm (64.8%), and BMI 18.5 to 25 kg/m ^{2} (51.9%).

Conclusion: Maternal factors that contribute to the birth of LBW babies include low parities, age 20 to 35 years during pregnancy, hypertension in pregnancy, infrequent antenatal care visits, high school degree, work as a housewife, height ranging between 151 -160 cm, and had a normal BMI. The representation of the mother's BMI and educational level in this study differs from that in previous studies.

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INTRODUCTION

Low birth weight (LBW) is a weight at birth of less than 2500 grams. Infants with low birth weights (LBW) have a higher chance of experiencing a decline in linear growth. Additionally, LBW was linked to underwhelming cognitive development and moderated growth of internal organs. This might impact cognitive abilities later in life and raise the risk of developing chronic illnesses. In Indonesia, low birth weight is the most important and dominant risk factor for stunting [1–3].

Stunting, defined by Z-score of less than -2 SD for body height to age ratio, is one of the most fundamental challenges in the journey of individual growth and development because it has long-term consequences: decreased cognitive ability, reduced productivity, and increased risk of infection and non-communicable diseases in the future [2, 4–6]. Reducing the incidence of stunting is a critical indicator of the second Sustainable Development Goal of Zero Hunger. It is also the first of the six goals of the Global Nutrition Targets for 2025, with a reduction target of 40% by 2025 [5, 6].

Various multidimensional factors contribute to LBW, including poor maternal health and nutrition [6]. Therefore, as a comprehensive prevention strategy to reduce the prevalence of LBW in Indonesia, it is necessary to overview several maternal risk factors that may contribute to it.

MATERIAL AND METHODS

This quantitative descriptive study was conducted at Dr. Saiful Anwar general hospital from July 2021 to September 2022. Subjects were selected using the purposive sampling method, with a minimum subject based on the Slovin formula of 44. Between July 2021 and September 2022, researchers interviewed pregnant women who delivered LBW babies at Dr. Saiful Anwar Malang General Hospital using the Maternity Support Service: Prenatal Screening Guide. The interviews were recorded along with information from the medical records [7].

The variables studied were maternal parity status, age at pregnancy, medical history, number of antenatal care (ANC) visits, educational degree, occupation, height, body mass index (BMI), and the baby's birth weight. The collected data were analyzed using univariate analysis of each variable and presented as distribution and percentage. This research was conducted in conjunction with the ethical process from the Health Research Ethics Commission, Faculty of Medicine, Universitas Brawijaya.

RESULTS

Fifty-four subjects of all full-term pregnant women who gave birth to LBW babies during July 2021-September 2022 met the inclusion criteria. The majority of subjects gave birth at 37-38 weeks (42.6%), followed by 38-39 weeks gestation (33.3%), 39-40 weeks gestation (13%), and 40-41 weeks gestation (11.1%). Subjects gave birth to more LBW babies with birth weights of 1500-2500 grams (Low Birth Weight) (94.4%), compared with birth weights of 1000-1500 grams (Very Low Birth Weight) (5.55%).

Based on Table 1, the age of the mother during pregnancy, most LBW babies were delivered by mothers aged 20-35 years (79.6%), followed by mothers aged more than 35 years (14.8%), and the least were mothers aged less than two twenty years (5.6%). The mother's medical history was grouped by organ system from the collected data. Mothers who gave birth to LBW babies were most those with a history of hypertension in pregnancy (25.9%), followed by mothers with a history of cardiovascular disease and COVID-19 (16.7% respectively), a history of autoimmune disease (14.8%), history of the haematological disease, placental disorder, and neurological disease (respectively 7.4%), history of metabolic disease and gastrointestinal disease (respectively 5.6%), and the least were history of the gynaecological disease (1.9%).

Based on the parity status, the distribution of LBW babies born decreases as the number of parity increases (Fig.1). Based on the number of ANC visits, the number of LBW babies was lower as the frequency of ANC visits increased (Fig.2).

The most educational level of mothers who gave birth to LBW babies was a High School degree (48.1%), followed by mothers with a Junior High School degree (24.1%), mothers with educational level Diploma/Bachelor degree (14 .8%), and mothers with primary school degree (13%). Based on the mother's occupation, housewives were the most gave birth to LBW babies (75.9%), followed by mothers who worked as employees (13%), civil servants or BUMN employees (5.6%), entrepreneurs (3.7%), and the least were mothers who are still students (1.9%). Based on maternal height, women with a height of 151-160 cm is the most that gave birth to LBW babies (64.8%), followed by mothers with a height of 140-150 cm (25.9%), and women who gave birth to the least LBW babies is the height of 161-170 cm (9.3%). Based on the body mass index (BMI), mothers with a BMI of 18.5-25 kg/m^2 were the most likely to give birth to LBW babies (51.9%), followed by mothers with a BMI of more than 25 kg/m^2 (29.6%), and mothers with a BMI of less than 18.5 kg/m^2 (18.5%).

DISCUSSION

In this study, out of 54 term pregnant women who gave birth to LBW babies, the majority of gestational age was 37-38 weeks, and birth weight was in the range of 1500 to 2500 grams. This statement is similar to research conducted by Muchami et al. in 2015 and Momeni et al. in 2017 that the younger the gestational age, the higher the risk of giving birth to LBW babies [8, 9]. This is because babies with shorter gestational ages have less time to grow in the womb, whereas most babies gain weight during the last week of pregnancy. Babies who have shorter gestational ages also have much lower levels of antibodies than babies born with longer gestations. This low antibody will make the baby susceptible to infection, so it can have an impact on malnutrition [10, 11].

Based on parity status, nulliparous mothers gave birth to the most LBW babies (42.6%). The distribution of LBW baby births decreases as the number of parity mothers increases. This description is similar to the research by Khan et al. in 2016 that 54% of mothers who gave birth to LBW babies in the study were primiparas, followed by 2 and 3 parities (33%) and more than three parities (13%) [12]. Research by Momeni et al. in 2017 also revealed that lower parity was associated with a higher risk of giving birth to LBW babies (OR: 0.85; $P < 0.001$) [9].

The mechanism of this phenomenon is likely to occur because mothers with lower parity have imperfect physical growth and tend to be malnourished. The lower birth weight among babies born as the first child is a

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Table 1. Characteristics of Research Subjects

Characteristics	N	%
Mother's Gestational Age (weeks)		
37 - 38	23	42,6
38 - 39	18	33,3
39 - 40	7	13.0
40 - 41	6	11,1
Baby's Birth Weight (grams)		
1000 – 1500 (LBW)	3	5.55
1500 - <2500 (VLBW)	51	94.4
Age (years)		
<20	3	5,6
20 – 35	43	79.6
>35	8	14,8
Medical History		
Hypertension in Pregnancy	14	25,9
Cardiovascular	9	16,7
COVID-19	9	16,7
Autoimmune	8	14,8
Haematology	4	7,4
Placental Abnormalities	4	7,4
Neurology	4	7,4
Metabolic	3	5,6
Digestion	3	5,6
Gynaecology	1	1,9
Education		
Primary School	7	13.0
Junior High School	13	24,1
Senior High School	26	48,1
Diploma/Bachelor degree	8	14,8
Occupation		
Housewife	41	75.9
Government employees	3	5,6
Employee	7	13.0
Self-employed	2	3,7
Student	1	1,9
Height (cm)		
140-150	14	25,9
151-160	35	64,8
>160	5	9,3
BMI (kg/m^2)		
< 18.5	10	18.5
18.5 – 25	28	51.9
>25	16	29,6

direct consequence of the physiological condition of the primigravida's body, which will increase more efficiently in each subsequent pregnancy. The uteroplacental blood flow, responsible for delivering oxygen and nutrients to the fetus, will be greater during subsequent pregnancies compared to a primigravid uterus. In addition, there may be structural factors that limit uterine capacity in the first pregnancy, and thereafter the size of the uterus will increase in proportion to the protein content in subsequent pregnancies. Firstborns are also exposed to a different mother's immune environment, thereby contributing relatively to growth restriction [13, 14].

Based on the age during pregnancy, mothers aged 20-35 gave birth to the most LBW babies (79.6%). This description is similar to the research conducted by Khan et al. in 2016, which showed that most mothers who gave birth to LBW babies were between 20 and 30 years old (82%), followed by mothers over 30 years old (12%), and fewest were mothers aged less than 30 years (6%) [12].

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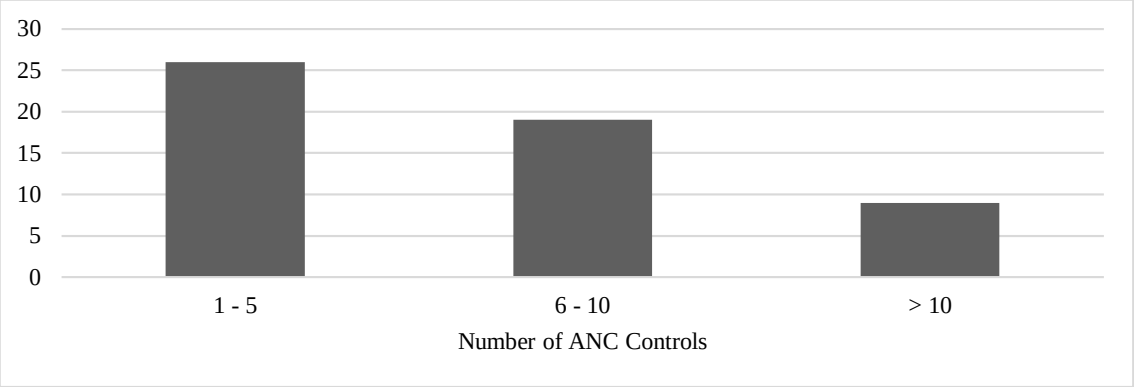


Fig. 2. Distribution of LBW Babies Based on the Number of ANC Visits.

This description is also similar to a study conducted by Yilgwan et al. in 2009 at the Jos Teaching Hospital, Nigeria, where the majority of mothers who gave birth to LBW babies were in the age group of 20-35 years (88%), followed by mothers aged 35 years and above (8.6%), and only three (3.4%) were less than 20 years old [15]. The biological mechanism of maternal age that causes LBW is probably due to low socioeconomic conditions, increased nutritional needs during pregnancy, low education, and low body mass index. Whereas in older mothers, the possibility of LBW is caused by biological factors such as chromosomal anomalies, pre-eclampsia, and diabetes [9,16].

In this study, the medical history of the mothers who gave birth to the most LBW babies were those with a history of hypertension during pregnancy (25.9%). According to Muchemi et al., comorbidities during pregnancy are significantly associated with low birth weight babies. These comorbidities include hypertension, pre-eclampsia, eclampsia, bleeding, placenta previa, placental abruption, premature rupture of membranes, anemia, tuberculosis, malaria, and HIV in pregnancy [8]. This description is similar to a study conducted in Yogyakarta, Indonesia, by Wahyuni and Elika in 2018, that there was a relationship between preeclampsia and LBW at Wonosari Hospital, Gunungkidul, with the results showing that women who experience preeclampsia are 2.114 times more likely to give birth with LBW compared to women who do not have preeclampsia.

The same thing was also found by Nakimuli et al. in 2020 that mean birth weight was significantly lower among pre-eclamptic cases (2.48 kg ± 0.81 SD) compared to normotensive pregnancies (3.06 kg ± 0.46 SD) ($p<0.001$). Hypertension in pregnancy causes placental abnormalities, vasospasm, and endothelial injury, resulting in an insufficient invasion of the blood vessel walls by the extravillous trophoblast. This would prevent spiral artery remodelling and thus reduce uteroplacental blood flow. Reduced blood flow to the uteroplacental causes the fetus to go hungry, resulting in LBW fetal growth [17,18].

Based on the number of ANC visits, mothers who had one to five ANC visits had the most LBW babies (26%). As the frequency of ANC increases, the number of LBW babies decreases. This description is not in accordance with the research conducted by Dai et al. in 2014, which revealed that women with 6 to 10 ANC visits were less likely to have LBW babies compared to women who had less than 5 ANC visits (OR = 0.52, 95% CI: 0.38-0.71). However, no protective effect was found for LBW in women with more than 10 ANC visits (OR: -0.82, 95% CI: 0.57-1.18) [19]. However, our findings are consistent with the statement in the Banchani and Tenkorag study in 2020, which revealed that the number of ANC visits at least 8 had a protective effect on the occurrence of LBW (OR=0.72, $p>0.01$). This study also states that the incidence of LBW is not only determined by the number of ANC visits but also by their quality.

Respondents who received a higher quality of care were 26% less likely to give birth to LBW babies. Some literature indicates that the content of care is more important than the number of contacts or ANC visits. Antenatal care, especially quality. Antenatal care will promote optimal maternal and fetal health because the mother will receive information about the importance of nutrition or receive interventions such as giving iron supplements, vitamins, and the tetanus vaccine [20].

This study found that 48.1% of mothers who gave birth to LBW babies had a high school education degree. This description is almost similar to the research conducted by Momeni et al., which revealed that the education level of mothers who gave birth to LBW babies the most was high school level (36.5%) [9]. However, this description is not in accordance with the research conducted by Dai et al. in 2014, which revealed that junior high school or lower eductional level was more related to LBW ($p<0.0001$) because mothers with that level of education had a lower number of ANC visits than those with higher levels of education [19]. The

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relationship between the mother's educational level and the incidence of LBW can be caused by differences in the ability to receive information about health services [9].

Based on the data on the mother's occupation, it was found that most LBW babies were born to housewives (75.9%), and the least were mothers who were still students (1.9%). This description is similar to a study conducted by Kandel et al. in 2021, which gets a higher percentage of LBW among housewives compared to other jobs. However, this finding was not statistically significant [21]. According to Sharma et al., this is because daily household chores, such as fetching water with large buckets, lifting heavy loads, and washing clothes/utensils for an extended period of time, are classified as heavy physical activities, which are the proximity factors to the birth of LBW babies [22]. Patil et al. also explained that women with high work intensity had a higher risk of LBW births compared to women with lower work intensity (RR: 1.48, 95% CI: 1.11-1.98) [23]. Research conducted by Sari and Soili states that 30% of mothers who work as entrepreneurs, students, and housewives have 1.67 times the risk (OR: 1.67, 95% CI 1.40-1.98) of experiencing depression during pregnancy, one of which resulted in LBW births (OR: 1.56, 95% CI 1.36-1.79) [24].

The mother's nutritional status is an important determinant of fetal growth and birth weight. Short maternal stature is one of the risk factors indicating a lack of maternal nutritional status, which increases the risk of LBW [25]. Based on data on the mother's height, mothers with a height of 151-160 cm are the most who gave birth to LBW babies (64.8%). This description is similar to research conducted by Amaha and Woldeamanuel in 2021, which showed that mothers with a height of 150-160 cm are the ones who gave birth to the most LBW babies (38.2%), followed by mothers with a height less than 150 cm (31.5%), and at least giving birth to LBW babies were mothers with a height of more than 160 cm (27.5%). This study also discovered that for every centimeter added to the mother's height, the risk of stunting was reduced by 1% [26]. Research conducted by Deriba and Jemal in 2021 also states that mothers with a height of 155 cm or less are more at risk of giving birth to LBW babies (OR=3.58; 95% CI =1.92, 6.7) [27].

Aside from the mother's height, BMI is also important in determining the mother's nutritional status. Maternal BMI plays a crucial role in determining infant outcomes, thus, becomes a strong predictor of birth weight [25]. In this study, mothers with a BMI of 18.5-25 kg/m^2 were the most gave birth to LBW babies (51.9%). This description is consistent with a study conducted by Britto et al. in 2013, which revealed that mothers with a BMI of 18.5-25 kg/m^2 were the ones who gave birth to the most LBW babies (50.1 %), followed by mothers with a BMI of more than 25 kg/m^2 (45%), and mothers with a BMI of less than 18.5 kg/m^2 (5.1%) [25]. However, research by Amaha and Woldeamanuel showed different characteristics, that mothers with BMI less than 18.5 kg/m^2 gave birth to more LBW babies (p=0.0001). This study also stated that each unit increase in BMI reduced the likelihood of stunting by 4% [26].

CONCLUSION

The majority of full-term mothers who gave birth to LBW babies at Dr. Saiful Anwar General Hospital between July 2021 and September 2022 were nulliparous, age during pregnancy was 20 to 35 years, had a history of hypertension during pregnancy, had one to five ANC visits, had a high school educational degree, works as a housewife, height of 151-160 cm, and had a normal BMI. These descriptions are mostly similar to several previous studies, except for the description of the mother's educational level and BMI.

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CONFLICT OF INTEREST

The authors declare there is no potential conflict of interest.

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